

THE DEVELOPMENT OF KOREAN LEXICAL ANAPHOR CAKI

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o. Introduction

This paper investigates the child's developmental aspects of grammar on the interpretation of Korean lexical anaphor caki under the assumption that a child acquires a formal theory of Lexical Functional Grammar (LFG). The analysis of experimental data demonstrates that the child determines the binding relationships between caki and its antecedent, under the guidance of syntactic constraints interacted with lexical or pragmatic properties. On the basis of my analysis of the experimental data on simple sentences, complex sentences and control structures I present learning procedures which explain the child's construction of grammar on the Korean lexical anaphor caki, conforming with Pinker's (1984, 1986) assumption that a child's hypothesis on rule formulation is conservative and continuous.

1. Basic Facts

Caki has the following broad characteristics:

- (1)a. its referent is a third person singular human NP;
b. it serves as a subject, an object, an oblique or a possessive NP in a sentence;
c. there is no clause-mated restriction on the choice of an antecedent.

Let me illustrate the syntactic characteristics of caki by providing specific examples. Throughout this paper coindexing means the intended coreference between caki and its antecedent.

- (2) Tom_i-i caki_i-lul/caki_i-uy hyung-ul chingchanha-n-ta.
Tom -N self -A self -G brother-A praise-Pres-Dec
'Tom praises self/self's elder brother.'

Within simple sentences caki obligatorily refers to a subject, as shown in (2) where a nominative-marked subject Tom is coindexed with caki.¹ If caki is the subject of a sentence, it cannot find its referent within a sentence, but has to look to an 'exophoric (sentence-external) NP for its referential dependency, i.e., it is discourse-bound. The asterisks in (3) indicate the impossibility of coreference between the coindexed elements.

- (3) *Caki_i/j-ka Tom_i-ul Mary_j-ekye chingchanha-ess-ta.
self -N Tom -A Mary -D praise-Pst-Dec

'Self praised Tom to Mary.'

In complex sentences, however, any subject can be a possible antecedent. This fact is shown in (4a-b):

(4)a. Tom_i-un [_scaki_i-ka hengpokha-ta]-ko sengkagha-n-ta.²

Tom-Top self-N happy -Dec-Comp think-Pres-Dec

'Tom thinks that self is happy.'

b. Tom_i-un [_{NP}[_sMary_j-ka caki_i/j-uy sazin-ul po-
Tom-Top Mary-N self_i/j-G picture-A look-
ko iss]-nun-ket-ul po-ass-ta.

Prog -Mod-Nom-A see-Pst-Dec

'Tom saw Mary looking at self's picture.'

Now let's consider the cases where there are two NPs which are potential to be a candidate for an antecedent of caki. In Korean a subject is preferred to be selected as an antecedent to an object or an oblique NP. (5a-b) shows this fact.

(5)a. Bill_i-i John_j-ekye caki_i/*j-uy os-ul iphi-ess-ta.
Bill-N John-D self_i/*j-G clothes-A put on-Caus

'Bill put on clothes on John.' (cf. Lee 1982:478)

b. Tom_i-i John_j-ekye caki_i/*j-uy kong-ul tenci-ess-ta.
Tom-N John-D self_i/*j-G ball-A throw-Pst-Dec

'Tom threw self's ball to John.' (cf. Cho 1985b:46)

However, several scholars made independent arguments, providing some examples of non-subject antecedent. (6a) and (6b) are representatives of ambiguous and non-subject bindings respectively.

(6)a. John_i-i Fred_j-lul caki_i/j-uy pang-e kadu-ess-ta.
John-N Fred-A self_i/j-G room-Loc lock-Pst-Dec

'John locked Fred in self's room.' (Hong 1985:22)

b. John_i-ekyelo caki_i-uy chinku-tul-i o-ass-ta.

John-to self-G friend-Pl -N come-Pst-Dec

'To John self's friends came.' (Lee, I-W 1978:67)

Even though there is some variation in intuitive judgements in (6a) as to whether only subject or both subject and object can be selected as antecedents, it is more natural for subject to be chosen as an antecedent rather than object. In my opinion this difference of judgements seems to be due to the different point of view of the interpreter of the sentences which stems from the meaning of verbs or situational contexts. Looking at (6b), however, no native speakers will deny the object antecedentship, even though dative-marked John is not a subject.

Finally, let me provide some more specific non-subject binding examples in order to have a better understanding of the exact nature of caki.

(7)a. Tom_i-un Bill_j-ekye caki_i/j-uy os-ul ip-kehaessta.

Tom-Top Bill-D self_i/*j-G clothes-A put on-made

'Tom made(or allowed) Bill put on self's clothes.'

b. Caki_i-uy chinku-tul-i Mary_j-lul jiltuha-ess-ta.

self-G friend-Pl -N Mary-A be jealous-Pst-Dec

- 'Self's friends were jealous of Mary.'
- c. [NP_s Caki_i-ka sihem-e silpheha]-n-sasil]-i Sue_i-lul
 self -N exam-in fail-Mod(Pst)-fact-N Sue - A
 sulph-ke ha-ess-ta.
 sad -Caus -Pst-Dec
 'The fact that self failed in an exam made Sue sad'
- d. Tom_i-uy kyet-eseo caki_i-uy nuna-ka T.V.-lul po-n-ta.
 Tom -G side-Loc self -G sister-N T.V.-A watch
 'Beside Tom self's sister watches T.V.'
- e. Tom_i-i John_j-ekye caki_i/j-uy kupu-chelum po-ess-ta
 Tom -N John -D self -G classmate-like seemed
 'It seems to John that Tom is self's classmate.'
- f. John_i-uy mitum-un [NP_s caki_i-ka yongkamha-ta]-nun-
 John -G belief-Top self -N brave-Dec -Mod-
 ketj-i- ta. (Yang 1983:187; cf. Mohanan 1981:18)
 Nom -be-Dec
 'John's belief is that self is brave.'

In a causative sentence (7a) not only subject Tom but also object Bill can be antecedents of caki. In (7b) where a subject includes caki, not a subject but an object is an antecedent. (7c) shows that when the subject of a sentence is not a human NP and caki is an element of an embedded clause, caki can refer to a non-subject. (7d) shows that a possessive anaphor caki can refer to a third person possessive NP. In (7e) Tom is a subject but it cannot be an antecedent because of the contradiction of the sentence meaning; instead, a dative object is an antecedent. In (7f) a genitive NP can be an antecedent, for it is also a subject in some level of representation (e.g. in f-structure in LFG).

2. The Acquisition of Lexical Functional Grammar

LFG is a formal theory of grammatical relation-mapping developed by Bresnan and Kaplan (cf. Bresnan, ed. 1982b) as an explicit means of representing a native speaker's syntactic knowledge. Pinker (1984) developed a theory of acquisition model assuming that a child acquires a rule system of LFG. The core idea underlying Pinker's developmental theory is that a child never expunges the entire grammar he or she formulates at an intermediate stage. In other words, a child's rule construction is conservative (cf. Pinker 1986) and continuous in the sense that the ultimate grammar a child comes to (i.e. adult's grammar) is not qualitatively different from the grammar constructed at a given intermediate stage. The continuity assumption is stated as follows: 'the child's grammatical rules should be drawn from the same basic rule types, and be composed of primitive symbols from the same class, as the grammatical rules attributed to adults in standard linguistic investigations' (Pinker 1984:7). The rest of this section describes how the Korean child

acquires syntactic structures conforming with the general mechanism of LFG, and gives a terminological explanation for the constraints postulated for the account of adult's linguistic knowledge on the interpretation of caki.

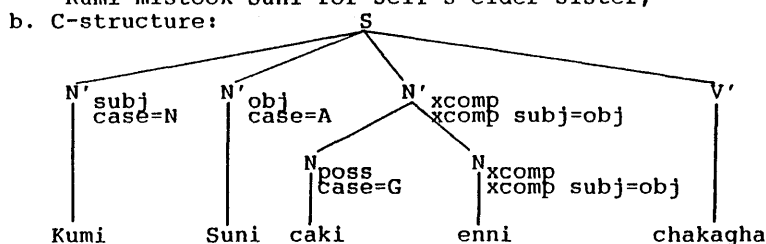
The word order in Korean is fairly flexible, except that verbs are in clause-final position. This flexible word order is possible because there are case makers or particles which indicate grammatical functions (GFs) of the NPs in a sentence. Thus, grammatical relations are encoded not by structural configurations but in terms of morphological markings (even though grammatical relations are consequences of structural configuration in Government-Binding Theory). According to Cho's (1982) experiment on the acquisition of word order in Korean her subject Anne produced a nominative marker 35.2 % of the time out of 670 multi-utterances at the age of 2;10, and the accusative marker was produced at age 3;4 for the first time. This indicates that case markers are acquired quite early in development even though Cho's (1982) subjects produced NPs without case markers most of the time in two-word utterances. In light of the fact that in Korean grammatical functions such as subject and object are encoded by case markers and particles, I assume that the Korean children acquire the syntactic structures for the sentence (8a) as in (8b-c):

(8)a. Kumi-ka Suni-lul caki-uy enni-lo chakaqha-ess-ta.

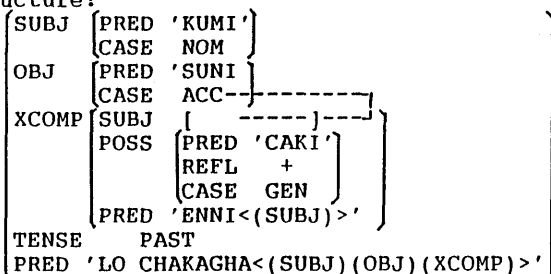
Kumi-N Suni-A self-G sister-as mistake-Pst-Des

'Kumi mistook Suni for self's elder sis

b. C-structure:



c. F-structure:



As shown above, there are two structures for the sentence (8a), namely, constituent structure (c-structure) and

functional structure (f-structure). C-structure is generated by the lexicon and phrase structure (PS) rules, whereas f-structure consists of an unordered syntactic, morphological and semantic category names and their values. This f-structure is the direct input to the semantic interpretation of a sentence. In this structure only dominance relation among constituents is discernible, since precedence relation is relevant to the c-structure. One thing to be noticed in (8b) is that categories introduced by PS rules are annotated by grammatical functions (e.g. subject, object, and complement), case markers and functional equations (e.g. xcomp subj=obj) from the lexical entries (cf. Pinker(1984) and Grimshaw(1981) for the acquisition of annotated PS rules based on semantic bootstrapping hypothesis).

Now, I will explain f-structure in relation to the structural conditions which constrain the adult's syntactic knowledge on caki-binding. I assume that the adults determine the binding relationships between caki and its antecedent, being constrained by the three conditions. Let me explain these conditions in turn.

(9) Subjecthood Condition

As already discussed in section 1, it is generally been assumed that reflexivization is triggered by a subject (cf. Shibatani 1977; Mohanan 1981, 1982, 1983). Also in Korean many grammarians who worked on reflexivization within a transformational or an interpretive model claimed that caki only referred to subject. This strong claim is mostly consistent with the native speakers' intuitive judgements, but bears many counterexamples systematically. Nonetheless, it is true that when there are two or more eligible antecedents of caki a subject takes the priority over a non-subject as shown in (5a-b). Looking at (8a), the object Suni can be an antecedent of caki, because it is a subejct in an f-structure (8c). Also in (7a) the object Bill can be an antecedent because it plays a subject role in an f-structure in LFG.

Next, let's turn to the second condition, f-command. In Government-Binding Theory the c-command is a universal principle governing anaphoric relations. In LFG which has a rather different structural configuration from that of GB theory f-command plays a core role in anaphora resolution. In Korean which has no VP node (at least in the framework of LFG), subject and object f-command each other if those grammatical functions are arguments of the same predicate. The GFs in the matrix sentence f-command those in the embedded clause, but not vice versa. Bresnan (1982a:334) gives a definition of f-command as follows:

'Tom hit self.'

b. Jim_i-i [sTom_j-i caki_i/ʔj-lul t'erinta]-ko malhessta
 Jim -N Tom -N self -A hit -Comp told

'Jim said that Tom hit self.'

(14)a. Motun salam_i-i caki_i-lul salangha-n-ta.
 every person-N self -A love-Non Pst-Dec
 'Everybody loves self.'

b. Tom_i-un [sMotun salam_i-i caki_i/ʔj-lul salanghanta]-
 Tom -Top every person-N self -A love-Non Pst-
 ko mit-ess-ta.

Comp believe-Pst-Dec

'Tom believed that everybody loved self.'

(15)a. Bill_i-i caki_i-uy hyung-chelum poi-n-ta.
 Bill -N self -G brother-like look-Pres-Dec

'Bill looks like self's elder brother.'

b. Tom_i-ekye [sBill_j-i caki_i/ʔj-uy hyung]-chelum
 Tom -D Bill -N self -G brother-like

poi-n-ta.

look-Pres-Dec

'It seems that Bill is self's elder brother.'

In (13a) Tom is an antecedent of caki, but in (13b) Jim which is a subject of the matrix sentence is preferred to be an antecedent to Tom which is a subject of an embedded sentence, even though the intended coreference between Tom and caki is possible. This ambiguity arises due to the semantic or pragmatic properties rather than syntactic ones. The purpose of next section is to test how the three conditions postulated in this section are predicted by the children.

3. The Analysis of Experimental Data and Explanation

3.1 Analysis 1: Simple Sentence

The test sentences in this section are designed by Cho(1985) to explain that the children come to understand caki-binding by developing Relational Hierarchy, i.e. Subject > Object > Genitive. My analysis will provide a rather different argument although the basic idea is a little similar.

A. Test Sentences (1):

(16)a. Tom_i-i John_j-ul caki_i/*j-uy pang-eseo milessta.
 Tom -N John -A self -G room-Loc pushed

'Tom pushed John in self's room.'

b. Tom_i-i Mary_j-uy cip-eseo caki_i/*j-uy chinku-lul
 Tom -N Mary -G house-Loc self -G friend -A
 poassta.

saw

'Tom saw self's friend at Mary's house.'

c. John_i-i Tom_j-hanthe caki_i/*j-uy cip-eseo miliessta
 John -N Tom - by self -G house-Loc be pushed

'John was pushed by Tom at self's house.'

d. Tom_i-uy tongseng_j-i caki_i/j-uy moca-lul sassta.
 Tom -G brother -N self -G cap- A bought
 'Tom's brother bought self's cap.'

B. Results (The percentage of responses)³

G	A	(16a)		(16b)		(16c)		(16d)	
		C	I	C	I	C	I	C	I
K1(4;5)		59	39	67	28	14	67	42	44
K2(5;8)		89	12	73	28	31	67	76	25
G1(7;0)		83	17	97	3	41	58	86	14
G3(9;0)		100	0	95	6	81	19	75	25
G5(11;1)		92	8	100	0	95	6	94	6

In all of the above test sentences there are two candidates for an antecedent of *caki*. In this subsection I will concern myself about how subjecthood and f-command conditions are observed by the children, on the basis of Cho's (1985) experimental results. In (16a-d) all groups of children other than K1 selected as a referent of *caki* a subject which is nominative-marked in this test sentences. However, there is an interesting developmental aspect of subjecthood condition. For instance, in (16c) which is a passive counterpart for (16a) except that *pang* 'room' is replaced by *cip* 'house', the younger children (K1-G1) chose an agent antecedent rather than a grammatical subject. The older children (G3-G5), however, came to understand that nominative-marked subject was an antecedent of *caki*, indicating that a semantic factor was overridden by a grammatical (syntactic) principle.

With regard to f-command condition there seems to be no convincing evidence showing that an antecedent must f-command *caki*, for even without f-command condition the subjecthood condition is sufficient to account for the binding relationships in (16a-d). In other words, without mentioning that Tom doesn't f-command *caki* in (16d) Tom-uy tongseng 'Tom's brother' is an antecedent because it is a nominative-marked subject. However, there is some plausible evidence showing the psychological reality of f-command in children. For an evidence let's look at (17a) and (17b) which are reversed counterparts for (16a) and (16b) respectively with respect to word order.

(17)a. John_i-ul Tom_j-i caki_i/j-uy pang-eseo milessta.

'Tom pushed John in self's room.'

b. Mary_i-uy cip-eseo Tom_j-i caki_i/j-uy chinku-lul poassta.

'Tom saw self's friend at Mary's house.'

In (17a) almost half of the children in each group were confused about the choice of an antecedent regardless of age. But in (17b) all groups of children except for K1 performed correctly without regard to word order. I'd

like to explain this phenomenon in terms of f-command ; namely, in (17a) both subject, Tom and object, John f-command caki, but in (17b) Mary doesn't f-command caki. This kind of mistake at an intermediate stage indirectly demonstrates the psychological reality of f-command in children. However, if we look at the following test sentences (18a-c) and their results we easily find that the f-command condition is not a universal principle.

A. Test Sentences (2)

- (18)a. Nay-ka Yeongi_i-lul caki_i-uy kyosil-eseo poassta.
 I -N Yeongi -A self -G classroom-Loc saw
 'I saw Yeongi in self's classroom.'
- b. Nay-ka Yeongi_i-uy enni_j-lul caki_i/j-uy kyosil-eseo
 I -N Yeongi-G sister-A self -G classroom-in
 po-ass-ta.
 saw
 'I saw Yeongi's elder sister in self's classroom.'
- c. Nay-ka Yeongi_i-uy chaek-ul caki_i-uy kapang-
 I -N Yeongi-G book -A self -G school bag-
 sok-eseo chacassta.
 inside-Loc found
 'I found Yeongi's book in self's school bag.'

B. Results (The number of responses)⁴

G	A	N	(18a)			(18b)				(18c)		
			C	Nay	O	C	Nay	Yeongi	O	C	Nay	O
K	6	1		1			1				1	
G3	9	30	21	9		13	11	5	1	13	14	3
G6	12	32	15	11	6	8	14	5	4	11	18	3

In (18a-c) the first person pronoun cannot be an antecedent of caki, but unexpectedly my son aged 6 chose Nay 'I' who was an experimenter (my wife) throughout all test sentences as the above results indicate. The older children (G3 and G6) also chose the first person pronoun almost by halves in each group. It seems, in my opinion, that the children first look to the subject of a sentence to find an element to which to relate caki. The first person pronoun Nay 'I' is a subject because it is nominative-marked and in sentence-initial position in this case.

3.2 Analysis 2: Complex Sentence

The sentences tested in this section are those which have one embedded clause within each of them. In general the younger children have difficulties in understanding complex sentences involving caki, so I prepared the data experimented with the higher grades.

A. Test Sentences

- (19)a. Chulsu_i-nun [_sYeongi_j-ka caki_{i/j}-lul calanghaessta]
 Chulsu-Top Yeongi-N self_{i/j}-A was proud of
 -ko malhaessta.
 -Comp told
 'Chulsu said that Yeongi was proud of self.'
- b. Chulsu_i-nun [_sYeongi_j-ka caki_{i/j}-lul coahanta]-
 Chulsu-Top Yeongi-N self_{i/j}-A like
 ko malhaessta.
 Comp told
 'Chulsu said that Yeongi liked self.'
- c. Chulsu_i-nun [NP[_sYeongi_j-ka caki_{i/j}-uy yenpil-ul
 Chulsu-Top Yeongi-N self_{i/j}-G pencil-A
 pulet'ri_j-n-ket_j-ul alkoissta'
 break-Mod(Pst)-Nom-A know
 'Chulsu knows that Yeongi broke self's pencil.'
- d. Chulsu_i-nun Yeongi_j-ekye [_sSunik_k-ka caki_{i/?j}/k-uy
 Chulsu-Top Yeongi-D Suni-N self_{i/?j}-G
 yenpil-ul pulet'riessta_j-ko malhaessta
 pencil-A break -Comp said
 'Chulsu told Yeongi that Suni broke self's
 pencil.'

B. Results

G	A	N	(19a)		(19b)		(19c)		(19d)		
			Chul	Y	Chul	Y	Chul	Y	Chul	Y	Sun
G4	9	10	5	5	5	5	7	3	3	7	.
G5	10	10	10	.	8	2	7	3	6	4	.
G6	12	10	8	2	7	3	9	1	10	.	.

Since there is no clause-bound restriction on the choice of an antecedent of *caki*, the element in matrix sentence or that in embedded clause are both qualified to be an antecedent in the above test sentences. Of these two qualified elements the children chose one element which they think is most appropriate in specific contexts whether they are linguistic, semantic or pragmatic. The purpose of test in this section is to see what contexts force the children to make a choice of an antecedent.

In test results above the group G4 showed no consistent choice, performing at a chance level, even making a wrong choice in (19d). The groups of G5 and G6 strongly preferred to choose an element in the matrix sentence to one in the embedded clause, even though the element in the latter is nearer to *caki*. If a Minimal Distance Principle (MDP) is a universal syntactic principle (C.Chomsky 1969) it is only effective in the minds of the lower level of children (G4). As I already discussed in section 2 the lexical meaning of the predicates in an embedded clause or a matrix sentence in conjunction with pragmatic properties plays a crucial

role in forcing the children to turn to an element outside of the embedded clause. Considering that the cases where an element in an embedded clause is an antecedent are extremely rare, it is not unreasonable to set up superiority condition as a syntactic context even though it gets involved in pragmatics or semantics.

3.3 Analysis 3: Control Structure

In this section I analysed the sentences where the lexical meaning of the predicates in embedded clauses overrides syntactic principles.

A. Test Sentences

- (20)a. Chulsu_i-ka Yeongi_j-ekye [caki_{*i/j}-man o-la]-
 Chulsu -N Yeongi -D self -only come-Imp-
 ko malhaessta.
 Comp told
 'Chulsu told Yeongi that only self should come.'
- b. Chulsu_i-ka Yeongi_j-ekye [e caki_{*i/j}-uy sukje-
 | control |
 Chulsu -N Yeongi self -G homework-
 lul hae-cunta]-ko malhaessta
 A do -give-Comp told
 'Chulsu told Yeongi that (he) would give the
 favor of doing the homework for Yeongi.'
- c. Chulsu_i-ka Yeongi_j-ekye [e caki_{i/*j}-uy sukje-
 | control |
 Chulsu -N Yeongi -D self -G homework-
 hae-ta-la]-ko malhaessta.
 do-give-Imp-Comp told
 'Chulsu asked Yeongi to give him the favor of
 doing the homework'
- d. Chulsu_i-ka Yeongi_j-ekye [e caki_{*i/j}-uy pan
 | control |
 Chulsu -N Yeongi -D self -G class
 hakseng-chelum pointa
 student-like seem
 'It seems to Yeong that Chulsu is a student of
 self's class.'

B. Results (The number of correct and incorrect responses)

G	A	N	(20a)			(20b)			(20c)			(20d)		
			C	I	O	C	I	O	C	I	O	C	I	O
G3	10	30	27	3	.	20	10	.	27	3	.	2	28	.
G6	12	32	29	2	1	25	7	.	31	1	.	8	23	1

In (20a) Chulsu which is the subject of a sentence cannot be an antecedent because the person who comes is not Chulsu, but Yeongi who received order from Chulsu. Also in (20b) Chulsu is the subject of the matrix sentence as well as of the embedded clause. But contrary to the

generalization made in section 2, Yeongi but not Chulsu is an antecedent of *caki*. About two thirds of the subjects made a right choice, but quite a few chose Chulsu which is the subject of (20b). And in (20c) both groups of children seem to have no difficulty in the choice of an antecedent because the choice of Chulsu depends on the lexical meaning of the verb, *hae-ta-la* 'do and give', sufficing also all conditions mentioned so far, i.e. subjecthood condition, superiority condition and f-command condition. Next, (20d) is a little tricky in the sense that a nominative-marked subject cannot be chosen as an antecedent because of the contradiction of the sentence meaning. As expected, both groups of children chose Chulsu which is the subject of (20d). This indicates that the computation of anaphoric relation requires the full understanding of the meaning of sentences. The experimenter told me that the children thought over and over again in computing the anaphoric relation; especially, the younger children (G1) didn't seem to understand the meaning of the test sentences.

Below let me describe the aspects of grammar on the interpretation of *caki*, on the basis of analysis in this section. First, in simple sentences if there is a third person singular subject which f-commands *caki* the children showed a strong preference for a subject as a choice of an antecedent; if the subject of a sentence is the first person pronoun, even the older children were confused about the correct choice, indicating that it takes a long time to master the complete aspects of anaphora. With respect to f-command condition the children understood that it was necessary for an antecedent f-command *caki*, but not sufficient to explain more data available. Secondly, in complex sentences I found that MDP doesn't apply well in explaining Korean anaphoric relation; instead I presented superiority condition. Thirdly, in control structures I only dealt with the data the interpretation of which depended on the lexical meaning of verbs. The control structure like causativization was not treated here, because the interpretation of these structures are predicted in LFG as I discussed in section 2. The following sections deal with the accompanying aspects which are related to the development of *caki*.

4. The Acquisition Procedure

On the basis of analysis and discussion in the previous section and more available data I provided below learning procedures which showed the aspects of the child's rule formulation on *caki*-binding.

(21) P(I):

- a. If there is a third person singular subject which f-commands caki,
 then if it is is nominative-marked
 then choose that as an antecedent,
 otherwise choose any subject;
- b. if not, choose any GF which f-commands caki and caki doesn't f-command if there is one;
- c. if not, choose any GF which caki doesn't f-command.

P(II): Examine the coreference relationship between caki and the nominative-marked GF which is chosen by P(I). If the nominative-marked GF is not a subject, then replace it with other subject in an f-structure. If there is another subject in an embedded clause (or nuclear structure) and the coreferentiality between caki and the subject in a matrix sentence doesn't exist disregard the superiority condition.

Below I will show how the above procedures are applied by the children. Let's first look at the following positive data.

- (22) a. Tom_i-i Sam_j-ekye caki_i/*_j-uy munce-lul iyakihaessta
 Tom -N Sam - D self -G matter-A told
 'Tom told Sam about self's matter.'
- b. Bob_i-to/k'acito/man Sam_j-ekye caki_i/*_j-uy munce-lul
 Bob -also/even/only Sam -D self -G matter-A
 iyakihaessta.
 told
 'Bob also/Even Bob/Only Bob told Sam about self's matter.'

In (22a) subject Tom f-commands caki and is nominative-marked, so it is chosen as an antecedent by the first half of Procedure (I). In (22b) Bob is the subject, but not nominative-marked. This choice of non-nominative-marked subject is made by the second half of Procedure (I).

Next, consider (23) in order to see how Procedure (Ib) applies.

- (23) a. Nay-ka Tom_i-ul caki_i-uy cip-eseo manassta.
 I -N Tom -A self -G house-Loc met
 'I met Tom at self's house.'
- b. Caki_i/*_j-uy hyung_i-i Tom_j-ekye ton-ul cuessta.
 self -G brother-N Tom -D money-A gave
 'Self's elder brother gave money to Tom.'

In (23a) there is no third person singular subject which f-commands caki, so Procedure (Ia) cannot be applied. By Procedure (Ib) Tom is chosen because it f-commands caki. In (23b) caki-uy hyung 'self's brother' is a subject but doesn't f-command caki because it contains caki. Procedure (Ib) makes it possible for Tom to be selected as an antecedent.

Finally, Procedure (Ic) applies in the following

positive data.

(24)a. Bill_i-uy kyet-eseo caki_i-uy nuna-ka T.V.-lul ponta
 Bill -G side-Loc self -G sister-N T.V.-A watch
 'Beside Bill self's elder sister watches T.V.'

b. Nay-ka Bill_i-uy kyet-eseo caki_i-uy sazin-ul poassta
 I -N Bill -G side-Loc self -G picture-A saw
 'I saw Bill's picture beside Bill.'

In (24a-b) Bill and caki don't f-command each other. By Procedure (Ic) Bill is chosen as an antecedent. This type of sentences is more complex than those in (22) and (23) in relating caki to its antecedent because it has two genitives which are at the lowest bound in Relational Hierarchy (cf. Comrie 1987). The order of procedures above are in the order of complexity in computing anaphoric relation.

Now, I will provide the sentences which are bypassed by Procedure (Ia-c). The sentences in (25) are ungrammatical if the coindexing means the intended coreference even though they are not negative data because in discourse context they are perfectly acceptable.

(25)a. *Caki_i-ka Tom_i-ul t'eriessta.
 self -N Tom -A hit

'Self hit Tom.'

b. *Nay-ka caki_i-lul Tom_i-uy cip-eseo t'eriessta
 I -N self -A Tom -G house-Loc hit
 'I hit self at Tom's house.'

5. Marked Caki-Binding

The procedure (I) in previous section predicts well in most cases in relating caki to its antecedent. However, there are some cases where the antecedent of caki chosen by Procedure (I) is a wrong choice. This binding relationships which are not governed by Procedure (I) will be checked by Procedure (II) which lets the children know whether the antecedent obtained by Procedure (I) is a right choice or a wrong one. Furthermore, if the antecedent chosen by Procedure (I) is not correct, Procedure (II) leads the children to come to the right choice. From the viewpoint of generative grammar in relation to language acquisition, marked structures are more complex than unmarked ones and usually a late development in the course of language acquisition. Below some types of marked structures are provided.

(26) Dative Subject Binding

a. John_i-ekye Tom_j-i caki_i/*j-uy sengkong-ul wihayo
 John -D Tom -N self/*j -G success -A for
 philyohata. (W.O'Grady 1986)
 be necessary
 'John needs Tom for self's success.'

- b. Mary_i-ekye Bill_j-i caki_i/*j-uy kupu-chelum pointa.
 Mary_i-D Bill_j-N self_i-G classmate-like seem
 'It seems to Mary that Bill is self's classmate.'
- (27) Apparent Object, but not Subject Binding
 a. Tom_i-i Bob_j-ekye [caki_i/*j-man o-la]-ko malhaessta
 Tom_i-N Bob_j-D self_i-only come-imp-Comp told
 'Tom told Bob that only self should come.'
- (28) Embedded Nuclear Structure Binding
 a. Tom_i-un [NP_s Mary_j-ka caki_i/*j-lul nwiuchi-ko iss]-
 Tom_i-Top Mary_j-N self_i-A feel remorse-Prog-
 nun-ket]-ul molunta.
 Mod-Nom -A not know
 'Tom does not know that Mary feels remorse for self.'

6. Description of Transition Stages

As we saw in section 3.1 to 3.3 the children advance their knowledge on caki-binding, making a large number of mistakes. For instance, the group K1 was massively confused about the choice of an antecedent, indicating that this group did not yet develop the principles whatsoever governing the binding relationships. The groups of K2 and G1 also misinterpreted passive sentences, generalizing that agent was an antecedent. Furthermore, all groups of children were confused about non-subject binding. Upon these peculiar developmental aspects it is not easy to divide those aspects into discrete stages. However, the general aspects can be seen in the course of development as follows:

(29) 1) Stage I (K1):

There were no constraints. In this stage even the following interpretations were possible.

- a. Tom_i-i John_j-ul caki_i-uy pang-eseo milessta.
 (cf. (16a))
 b. Tom_i-uy tongseng-i caki_i-uy moca-lul sassta.
 (cf. (16d))
 c. Tom_i-i Mary_j-uy cip-eseo caki_i-uy chinku-lul poassta.
 (cf. (16b))

2) Stage II (K2-G1):

- i) The development of f-command condition
 ii) The gradual development of subjecthood condition
 In this stage the misinterpretation of sentences in Stage II diminished outstandingly, but the following interpretation was possible.
- a. John_i-i Tom_j-hanthe caki_i-uy cip-eseo miliessta.
 (cf. (16c))
 b. John_i-ul Tom_i-i caki_i-uy pang-eseo milessta.
 (cf. (17a))

3) Stage III (G3-G5): The partial mastery of subjecthood condition

In this stage the misinterpretation in Stage II was eliminated, but the children were still confused about the subjecthood condition in the sentence with

the inversion of subject and object. The following interpretation was also possible.

- a. Nayi-ka Yeongij-lul caki/j-uy kyosil-eseo poassta.
(cf. (18a))

4) Stage IV (Adults: Putative):

i) The full development of subjecthood condition.
In this stage all of the above misinterpretations must be eliminated.

ii) Non-subject binding. In this stage a non-subject can be an antecedent of caki according to learning procedures. For instance, the ambiguous interpretation is recognized.

7. Conclusion

The investigation of the child's developmental notion of grammar on caki-binding is made in this paper under the assumption that a child follows the general mechanism of LFG. The experimental results show that the child's grammar construction with respect to Korean lexical anaphor caki is sensitive to syntactic principles such as subjecthood condition and f-command underlying the adult's syntactic knowledge. Furthermore, it is demonstrated that syntactic principles are interacted with lexical or pragmatic properties in determining anaphoric relations of caki. On the basis of data analysis I presented Learning Procedures which showed how the children came to the proper and natural interpretation of caki. These Procedures caused the order of acquisition and transition problems, evidencing that some structures were difficult to learn and a late development in stages. Lexical Functional Theory of Acquisition which employed Procedures and markedness facilitated the explanation for the development of Korean lexical anaphor caki, further supporting the interaction of grammatical theory and language acquisition.

NOTES

- 1 In Korean the unmarked case for subject is nominative.
- 2 Korean is not a topic-prominent language, even though argument or non-argument topic NP is frequently used. In this paper topic NP represents a subject of a sentence. Throughout this paper the following abbreviations are used.

N=nominative	Dec=declarative	Mod=modifier
G=genitive	Top=topic	Nom=nominaliser
A=accusative	Comp=complementiser	Pst=past
D=dative	Caus=causative	Pres=present
Pl=plural	Prog=progressive	Loc=locative

- 3 C and I mean correct and incorrect responses.

- ⁴ G, A and N stand for grade, age and number of subjects respectively.

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